28990 Investigation of Environmental

Change Pattern in Japan

(Classification of Shorelines)

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Abstract

Typical shorelines, reclaimed, Ria and sand are selected as study areas. Digital scene in the CCT ID No.223200473 prepared from MSS is converted to print map and also to coloured images.

In the reclaimed areas in Nagoya and Yokkaichi MSS band 4 shows the progression of the reclamation distinctly. The Ria shoreline of Sima peninsula depicted by MSS shows good correspondence to the real one. Sand beaches along Atsumi peninsula shows good accordance between each shorelines of 4 bands images.

1. Introduction

It is noticed that the LANDSAT data about the oceanographic environment seems to be quite useful for hydrographic service, so the writers examined the method of classification of shorelines about reclaimed lands, Ria shorelines and sand beaches by means of analizing the black-and-white bulk film and CCT data, using one of the least cloud covered

scene around Ise Bay.

2. Techniques

Topographies and water depth adjacent to the shorelines have been surveyed in detail and aerial photographs around the harbour area were taken. A part of the studied area were actually investigated on August 27, 1976.

Band 7 information was used for confirmation of shorelines. Other bands were used for identification of spectral characteristics of land and sea areas adjacent to the shorelines.

The computer, NEAC 2200/500, of Hydrographic Department have been used in order to decode and to analyze the CCT, and required softwares have been prepared by staffs in the office.

A line printer was used for output of analyzed result. Some results were showed on a colour display tube and photographed.

3. Accomplishments

(1) Reclaimed lands

Reclamations in urban seaside areas and near-harbour areas are progressing rapidly to be made factory grounds since 1960's.

In general, characteristics of reclaimed lands were detected spectrally by MSS. The reflectance of surface soils of every four bands has increased depending on the lapse of time after the reclamation, and this tendency is remarkable on band 6 and band 7 data.

It is considered that the progress of a reclamation or a lapse of time is brought about decrease of water content in surface soils, increase of pavements and/or constructions, so it probably makes the increase of surface reflectance. And these tendencies would be observed

especially on band 6 and band 7 data. Reclamations have progressed in order of the construction planning, so that surface radiance of reclaimed lands indicates the degrees of the advancement of reclamation. The newer reclaimed lands show much black pattern on the photograph of black-and-white positive.

Fig.1 shows the colour composite image to be made from CCT of band 4,5 and 7around Nagoya hafbour. The reclaimed lands are shown bluish in colour. On the reclaimed lands in southern and western part of Nagoya harbour, inland areas behind old shorelines (natural shorelines) as displayed greenish in colour were distinguished from reclaimed lands.

Fig.2 shows a colour composite image around Yokkaichi harbour. A colour tone of the reclamation areas,center of this figure, can be divided into four stages, which means a different construction ages. The darker part means the newer reclamation.

Fig.3 shows the differences of the density based on various reclamations in the center of Yokkaichi harbour by CCT data. The X-axis indicates the sum of band 4 and band 5, and Y-axis indicate the difference subtracted band 7 from band 6. CCT values of reclamation can be classified into five groups in the X-Y plane, and the values of the frequency are indicated with Arabic numerals, and for the values over ten the letters A(10,11), B(12,13), C(14,15), D(16,17), E(18,19), F(20,21), G(22,23), H(24,25) and K($\geq$26) are adopted, moreover the numbers of frequency 1 and 2 are omitted to make clear the figure. Among the five clusters in the Fig.3, the lowest density group(below left side) indicates the sea water, and other four groups correspond to the reclaimed lands which were constructed during four consecutive periods of construction. Obviously the monotonous change of the spectral

reflectance of reclaimed lands have a linear relation to the age of their constructions. The older reclamation shows the higher reflectance.

(2) Ria shorelines

Sima peninsula has a typical Ria shoreline. Fig.4 shows that the sea water was coloured by band 7 data and land areas are composed by band 4 and band 5 data. Shorelines in Fig.4 show good similarity to the real one. It is also possible to discern many objects from the CCT data, for example trees, rocks and houses, without doing a field survey. It is effective that pre-research by MSS data are used for detecting some changes around shoreline.

Near shoreline, band 4 and band 5 radiance from the sea contain some informations about the sand in the sea. We are studying how to make analysis of them.

(3) Sand beaches

On the sand beach along Atsumi peninsula of the Pacific Ocean side, the shoreline was able to be distinguished by CCT data of every four bands. It might be considered that analyzed MSS data was taken near high tide.

It is a future problem how to estimate the content of sand volume in the sea water from the radiation of band 4 and/or band 5 data off sand beach areas.

4. Significant results

In Japan, lands and near shore areas have been surveyed in detail by several agancies. We are interested that MSS data can be utilized

for the purpose of detecting the indication of minor environmental changes which are displayed as spectral characteristics, for example, of ground reflectance or radiation rather than the method of utility for topographic image.

Significant results in this program are described as follows;

(1) Band 7 data clearly shows the boundary between land and sea areas. It may be easy to depict the shorelines automatically by CCT data, except for cloud covered areas.

(2) Spectral measurements of the sea surface by MSS data are a new field for hydrographic survice, so that LANDSAT data give many ideas for technical development in the future.

If we could get digital values from MSS data, it would be possible to realize the automated processing of so many informations and it were confirmed in this program that LANDSAT data have many merits for our routine works.

5. Publications

No.

6. Problems

(1) Radiation degrees of low-gain data from the sea surface is less than we can detect, so that radiation differences of useful informations are buried in the noise.

(2) Effective atmosphere model is necessary to determine the path radiance in band 4 and 5 wave regions.

(3) It is necessary to fit the data by ships and/or airplanes in the data by satellites.

7. Data Quality and Delivery

No.

8. Recommendations

It is desirable to obtain high-gain data for radiation in the sea area even though the geometric resolution becomes worse, for example it is proposed that detectors that have high gain but wide view in band 4 and band 5 be provided as 7th and 8th detector.

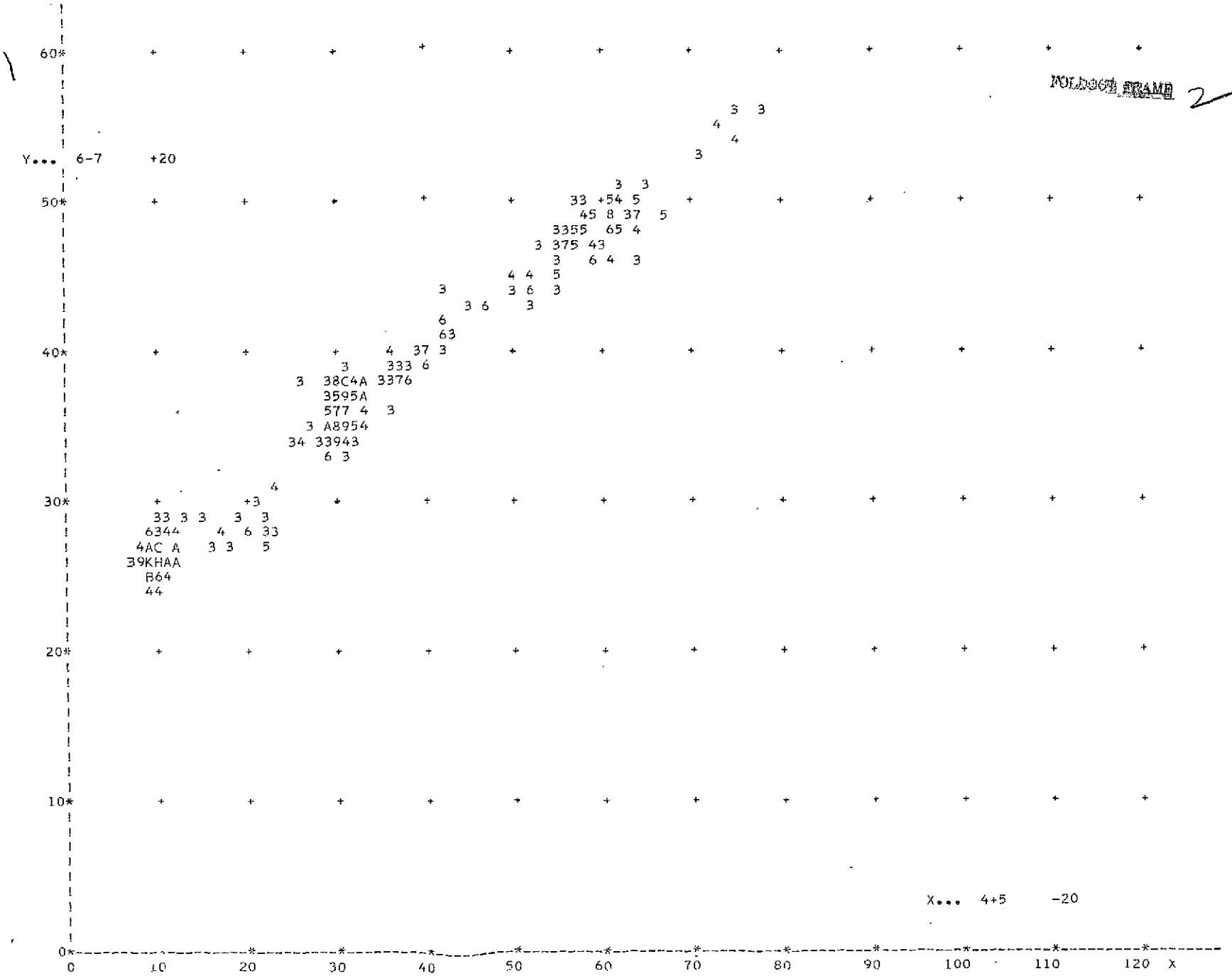

Fig.3 Density correlation diagram on the reclamation of Yokkaichi

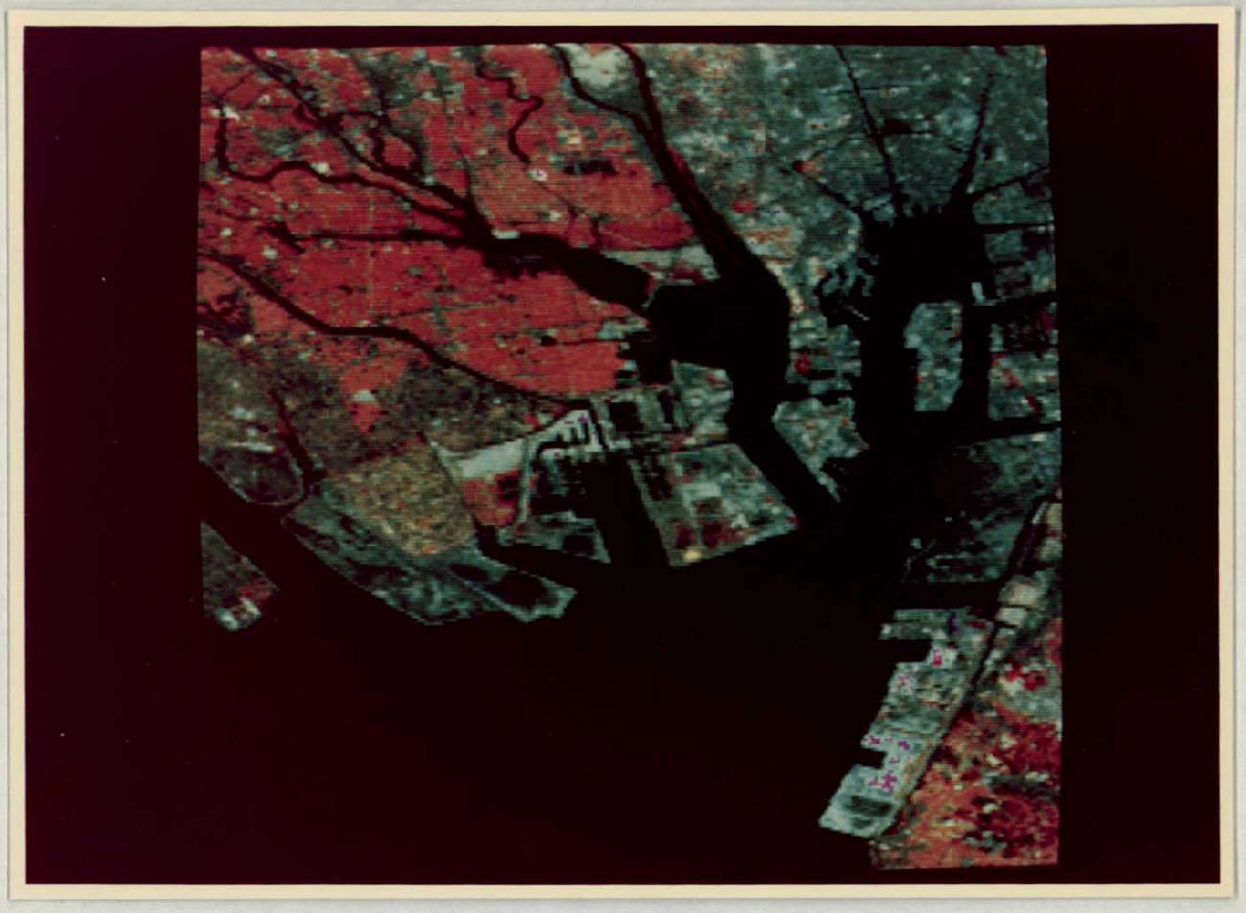

Fig. 1 Colour composite image near Nagoya harbour

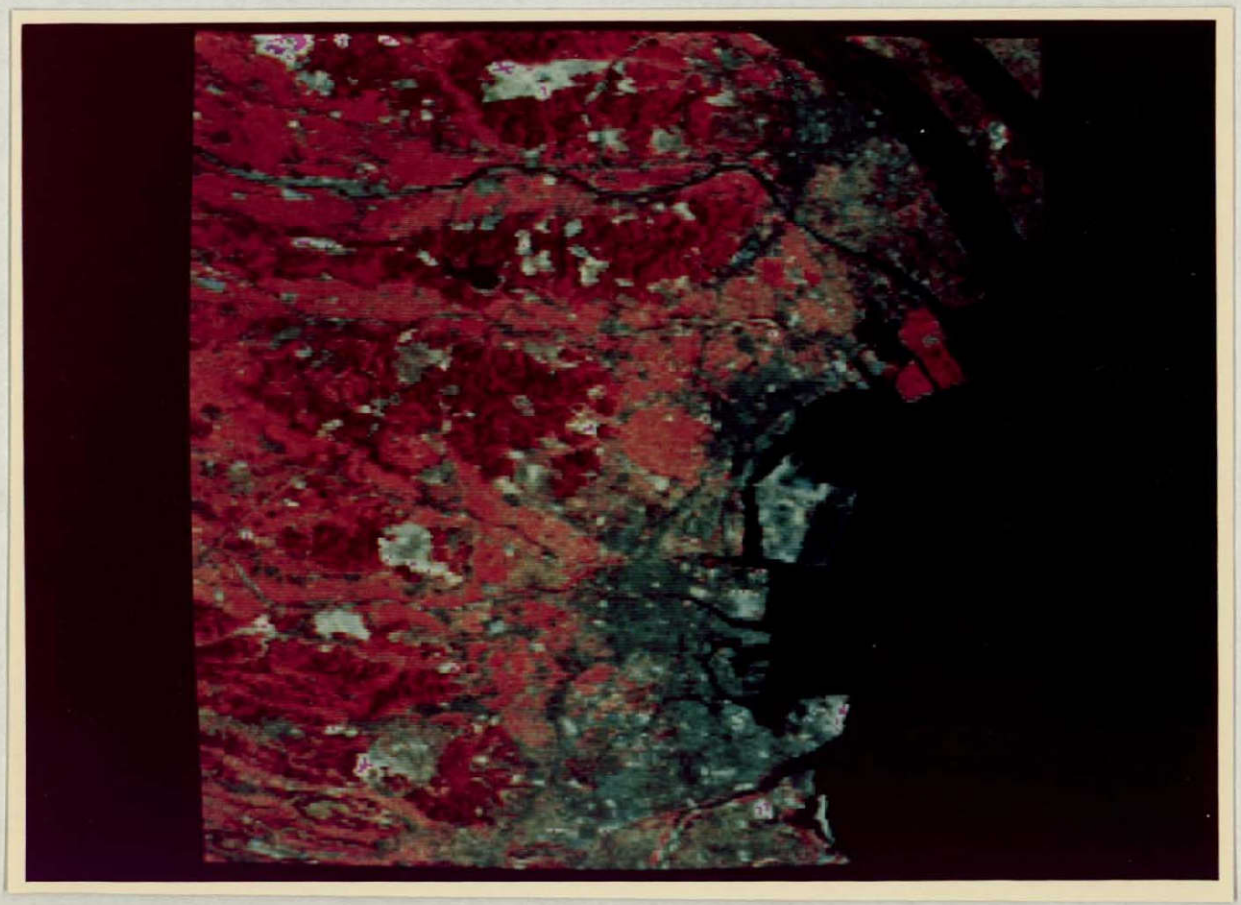

Fig.2 Colour composite image near Yokkaichi harbour

Fig.4 Colour composite image showing Ria shoreline